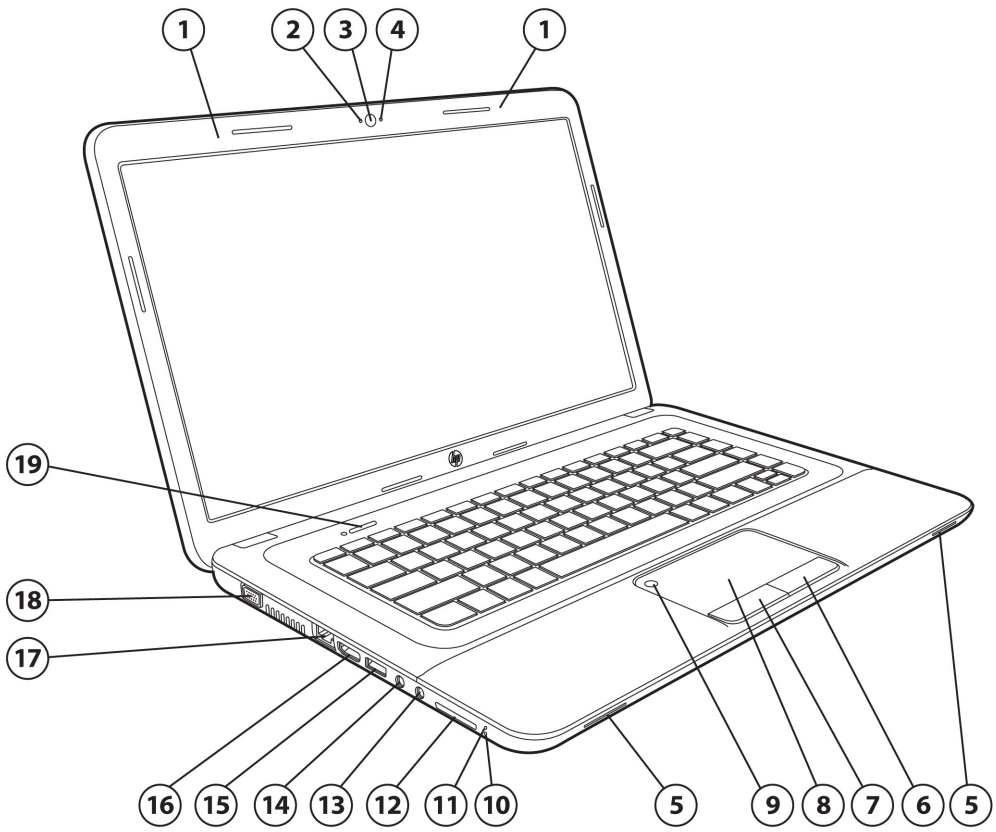
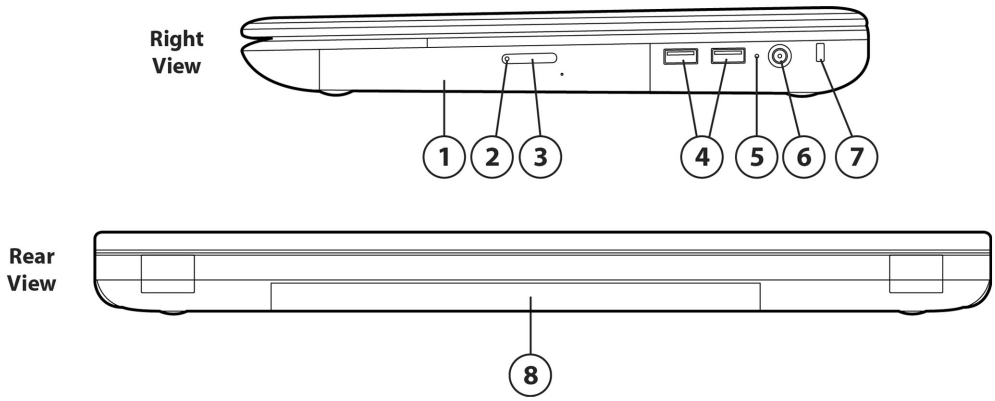
Overview

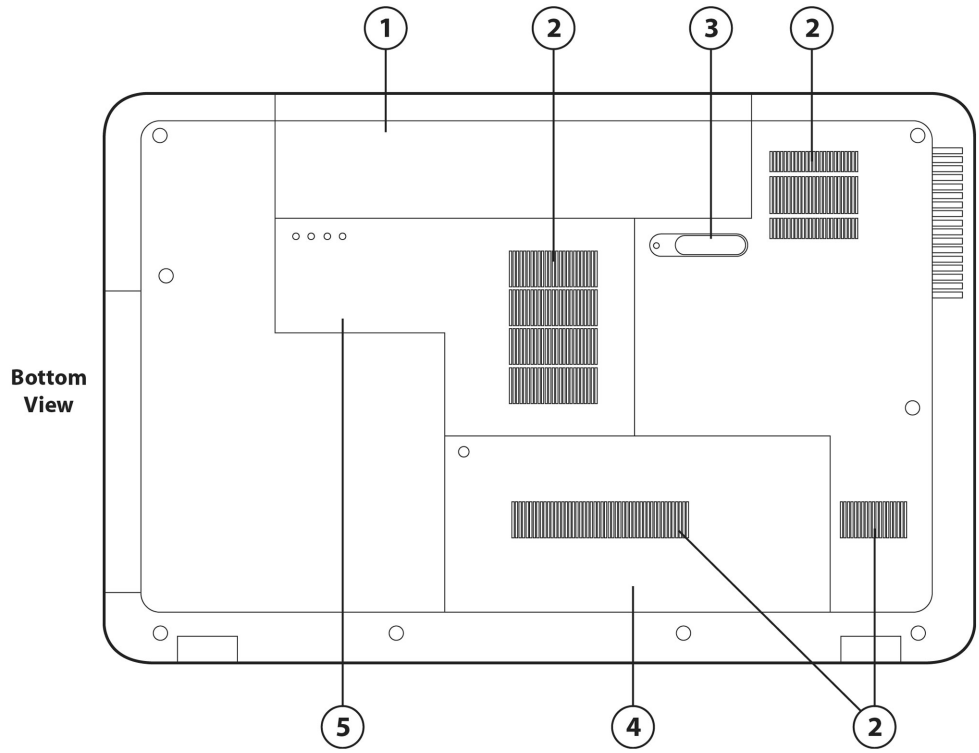


1. WLAN antennas (select models only)
2. Webcam light
3. Webcam
4. Internal microphone
5. Stereo speakers
6. Right TouchPad button
7. Left TouchPad button
8. Touchpad with scroll zone
9. TouchPad on/off button
10. Hard drive light
11. Power light
12. Digital media slot
13. Audio-out (headphone) jacks
14. Audio-in (microphone) jack
15. USB port
16. HDMI port
17. RJ-45 (Ethernet)
18. External monitor port
19. Power button

Overview



1. Optical drive
2. Optical drive light
3. Optical drive eject button
4. USB ports
5. AC adaptor light
6. Power connector
7. Security cable slot
8. Battery bay



1. Battery bay
2. Vents
3. Battery release latch
4. Hard drive bay compartment
5. Wireless compartment, and memory module compartment, keyboard screw, and optical drive bay.

Overview

At A Glance

- Windows 8 versions, Windows 7 versions, SUSE Linux, FreeDOS 2.0*
- Intel® HD Graphics Family with shared memory
- Durable, sophisticated design with smooth surfaced charcoal color.
- Full-sized keyboard with action keys enabling functions directly
- HDMI port for connecting to high-resolution displays
- Integrated HD or VGA webcam, integrated microphone
- Optional 802.11 b/g/n 1x1wireless LAN module**
- Bluetooth™ 2.1 or Bluetooth™ 4.0 + High Speed (HS)**
- 15.6" diagonal LED-backlit HD anti-glare display

* Operating system options vary by country.
** Select models only (BT4.0 HS supports under Windows 7 OS only, BT2.1 supports under Linux)

Features

OPERATING SYSTEM

Preinstalled	Windows 8 64* Windows 8 Pro 64* Windows 7 Professional (available through downgrade rights from Windows 8 Pro)** Windows 7 Professional 64* Genuine Windows 7 Home Premium 64* Genuine Windows 7 Home Basic 64* SUSE Linux Enterprise Desktop 11 Ubuntu Linux Available 1C13 FreeDOS 2.0
Certified	SUSE Linux Enterprise Desktop 11

* Not all features are available in all editions of Windows 8. Systems may require upgraded and/or separately purchased hardware, drivers and/or software to take full advantage of Windows 8 functionality. See http://www.microsoft.com for details.
** This system is preinstalled with Windows® 7 Pro software and also comes with a license and media for Windows 8 Pro software. You may only use one version of the Windows software at a time. Switching between versions will require you to uninstall one version and install the other version. You must back up all data (files, photos, etc.) before uninstalling and installing operating systems to avoid loss of your data.
*** Not all features are available in all editions of Windows 7. This system may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. See http://www.microsoft.com/windows/windows-7/ for details.

PROCESSOR

2nd Generation Intel® Core™ i3-2370M (2.4 GHz, 3 MB L3 cache, 2 cores)*
Intel® Pentium® B970 (2.3 GHz, 2 MB L3 cache, 2 cores)*

* Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture-enabled BIOS. Performance will vary depending on your hardware and software configurations. Intel's numbering is not a measurement of higher performance.

CHIPSET

Mobile Intel® HM70 Express (Intel® Pentium processors)
Mobile Intel® HM75 Express (Intel® Core™ processors)

GRAPHICS

Integrated: Intel® HD Graphics
Intel® HD Graphics (Intel® Pentium® processor)
Intel® HD Graphics 3000 (2nd Generation Intel® Core™ i3 processor)
Intel® HD Graphics 4000 (3rd Generation Intel® Core™ i3 processor)

Features

DISPLAY

Internal
15.6" diagonal LED-backlit HD 16:9 widescreen anti-glare (1366 x 768)
External
Up to 32-bit per pixel color depth
VGA
Port supports resolutions up to 2048 x 1536 external resolution @75 Hz
HDMI
1.4 port supports up to 1080p, 1920 x 1080 at 60Hz

NOTE: Resolutions are dependent upon monitor capability, and resolution and color depth settings.

STORAGE AND DRIVES

Primary Storage Bay
Hard Drives
320/500 GB 5400 rpm SMART SATA II
DriveGuard
The hard drive is mounted directly to the notebook frame, reducing the transmission of shock to the hard drive

NOTE: Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software.

OPTICAL DRIVES

Fixed Optical Drive
DVD+/-RW SuperMulti DL Drive
Weight saver

MEMORY

Standard
DDR3 SDRAM (1600 MHz) or DDR3/3L SDRAM (1600 MHz)**
Two SODIMM slots supporting single channel 2048 MB and 4096 MB SODIMMs

* Maximum memory speed supported by the system may be 1333 MHz or 1066 MHz.
NOTE: Due to the non-industry standard nature of some third-party memory modules, we recommend HP branded memory to ensure compatibility. If you mix memory speeds, the system will perform at the lower memory speed. With Windows Starter 32-bit operating systems, the amount of usable memory is dependent upon your configuration, so that above 3 GB all memory may not be available due to system resource requirements.

Features

NETWORKING/COMMUNICATIONS

Wireless
Ralink 802.11 b/g/n (1x1) wireless LAN module (Windows 8 only)
Ralink 802.11 b/g/n (1x1) + Bluetooth™ 4.0 combo (Windows 8 only)
Optional 802.11 b/g/n (1x1) wireless LAN module
Bluetooth™ 2.1* or Bluetooth™ 4.0* + High Speed (HS)
Communications
Realtek Ethernet (10/100/1000 NIC)

* Bluetooth™ 4.0 is supported in Windows 7 OS only, Bluetooth™ 2.1 is supported in Linux
NOTE: In countries where 802.11n is not allowed, this capability is not enabled.

AUDIO/MULTIMEDIA

Audio
Integrated Altec Lansing Stereo Speakers
Integrated microphone
High Definition Audio support

Webcam
Integrated VGA webcam
Integrated HD Webcam

- Supports videoconferencing and still image capture
- Improved quality for video streaming and still image capture (1280x720 resolution)
- Up to 30 frames/sec
- Fixed focus lens

KEYBOARDS/POINTING DEVICES/BUTTONS & FUNCTION KEYS

Keyboard
The 100% compatible keyboard features a, industry standard, full-pitch key layout with features such as the isolated inverted-T cursor control keys, editing keys, both left and right control and alt keys, and 12 function keys. International key layouts are available. Other features include hotkeys for instant access to, brightness, etc. 19-mm x 19-mm key pitch (center-to-center spacing), 2.2-mm stroke, comfort-dished keycaps, and bright key legends for improved visibility in low light conditions.

Pointing Devices
Touchpad with 2-piece pick button with left and right click functions
Multi-touch gestures supported

Buttons and Function Keys
On/off button

Features

SOFTWARE AND SECURITY

Preinstalled Software with Windows Operating System

HP Recovery Manager (Windows 7 only)
HP Support Assistant*
HP Wireless Hotspot* (Windows 8 only, web download)
HP Connection Manager* (Windows 7 only)
Cyberlink Power DVD***
Cyberlink YouCam DE****
Symantec Norton™ Internet Security 2012 (60-day trial)
Getting Started with Win8 (Windows 8 only)
NOTE: HP Recovery Manager enables fast recovery of the factory preinstalled image if the system becomes corrupted or if important system files are accidentally deleted. Up to 16 GB (for Windows 7) and 36 GB (for Windows 8) of system disk is reserved for the system recovery software. Support in Windows Operating System only.

Additional Software

Microsoft Office 2010 60 days trial (Windows 8 only).
Microsoft® Office Starter (Windows 7 only): reduced-functionality Word and Excel® only, with advertising. No PowerPoint® or Outlook®. Buy Office 2010 to use the full-featured software.**
CompuTrace® Software (must be purchased separately)

Security

Security Lock slot (lock must be purchased separately)
NOTE: The Computrace agent is shipped turned off, and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging multiple years. Service is limited, check with Absolute for availability outside the U.S.

For more information on HP security solutions refer to: http://www.hp.com/go/security.

Custom Integration Services provides tailor-made, turnkey solutions for Business Ready PCs.

* Not available in all regions.
** Includes reduced functionality versions of Word and Excel. Purchase of Product Key required to activate full Office 2010 suite available at participating resellers/retailers and www.office.com.
*** Available on select models and not available in all regions.
**** Available on select models.

Features

POWER

Power Supply

External 65W HP AC adapter

Primary Battery

HP 6-cell (47 WHr) Li-Ion battery
Battery life up to 6 hours*

System Standby Time

Up to 1 week

*Battery life will vary depending on the product model, configuration, loaded applications, features, use, wireless functionality and power management settings. The maximum capacity of the battery will naturally decrease with time and usage. See MobileMark07 battery benchmark http://www.bapco.com/products/mobilemark2007 for additional details.

NOTE: Fast Charge recharges your battery up to 90% within 90 minutes when the system is off. The HP Fast Charge is only for 6 cell/47 WHr battery pack.

Power Conservation

Hibernation*
Standby*
ACPI compliance*

* Only Windows 7 and Linux will feature power conservation.

ENVIRONMENTAL

US Energy Star
IT ECO Declaration
EPEAT – Silver where HP registers commercial notebook products. See http://www.epeat.net for registration status in your country.

NOTE: This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks.

WEIGHTS & DIMENSIONS

Weight

Starting at 5.39 lb (2.45 kg)

Dimensions (w x d x h)

14.80 x 9.72 x 1.41 in
37.6 x 24.7 x 3.58 cm

NOTE: Height varies depending upon where on the notebook the measurement is made. Weight varies by configuration and components. Weight includes 6-cell battery, hard drive, 1 GB memory, and optical drive. Weight varies by configuration and components.

Features

PORTS/SLOTS

Ports
VGA – One
HDMI – One
Stereo microphone in – One
Stereo headphone/line out – One
Power Connector – One
RJ-45 (Ethernet) – One
USB 2.0 – Three

Digital Media Slots
Supports SD (Secure Digital), and MMC (MultiMedia Card)
Supports mini versions with adapter

SERVICE AND SUPPORT

HP Services offers limited 1-year warranty options depending on country;
1-year limited warranty on primary battery. On-site service and warranty upgrades are also available. HP Care Pack Services extend service contracts beyond the standard warranties. To choose the right level of service for your HP product, use the HP Care Pack Services Lookup Tool at: http://www.hp.com/go/lookuptool. Additional HP Care Pack Services information by product is available at: http://www.hp.com/services/carepack.

NOTE: Certain restrictions and exclusions apply. Consult the HP Customer Support Center for details.
http://h20000.www2.hp.com/bizsupport/TechSupport/ProductRoot.jsp

SYSTEM UNIT

Dimensions (w x d x h)	14.8 x 9.72 x 1.41 in 37.6 x 24.7 x 3.58 cm
Weight	Starting at 5.39 lb (2.45 kg)

NOTE: Height varies depending upon where on the notebook the measurement is made. Weight varies by configuration and components. Weight includes 6-cell battery, hard drive, 1 GB memory, and optical drive. Weight varies by configuration and components.

Stand-Alone Power Requirements (AC Power)	**Nominal Operating Voltage**	18.5/19.5V
	Average Operating Power	Integrated graphics: 12.741 W* *Support models with Intel® HM75/HM70 Express Chipset
	Max Operating Power	< 65 W
Temperature	**Operating**	32° to 95° F (0° to 35° C) (not writing optical) 41° to 95° F (5° to 35° C) (writing optical)
	Non-operating	-4° to 140° F (-20° to 60° C)
Relative Humidity	**Operating**	10% to 90%, non-condensing
	Non-operating	5% to 95%, 101.6° F (38.7° C) maximum wet bulb temperature
Shock	**Operating**	40 G, 2 ms, half-sine
	Non-operating	200 G, 2 ms, half-sine
Random Vibration	**Operating**	0.75 grms
	Non-operating	1.50 grms
Altitude (unpressurized)	**Operating**	-50 to 10,000 ft (-15.24 to 3,048 m)
	Non-operating	-50 to 40,000 ft (-15.24 to 12,192 m)
Planned Industry Standard Certifications	**UL**	Yes
	CSA	Yes
	FCC Compliance	Yes
	ENERGY STAR®	Select models*
	EPEAT	Registered Silver in United States**
	ICES	Yes
	Australia / NZ A-Tick Compliance	Yes
	CCC	Yes
	Japan VCCI Compliance	Yes
	KC	Yes
	BSMI	Yes
	CE Marking Compliance	Yes
	BNCI or BELUS	Yes
	CIT	Yes
	GOST	Yes

Saudi Arabian Compliance (ICCP)	Yes
SABS	Yes
UKRSERTCOMPUTER	Yes

* Configurations of the HP 650 that are ENERGY STAR qualified are identified as HP 650 ENERGY STAR on HP websites and on www.energystar.gov.
** EPEAT registration varies by country. See www.epeat.net for registration status by country.
EPEAT status listed above applies to U.S.

For accessibility information on HP products, please visit: http://www.hp.com/accessibility.

DISPLAY

15.6-inch LED HD (1366 x 768) Anti-glare	**Active Area** (w x h)	13.54 x 7.59 in (34.4 x 19.4 cm)	
	Diagonal Size	15.6 in (39.6cm)	
	Surface Treatment	Anti-glare	
	Contrast Ratio	300:1 (min)	
	Refresh Rate	60 Hz	
	Brightness	200 nit (typical)	
	Pixel Resolution	**Pitch**	0.252 mm
		Format	1366 x 768
		Configuration	RGB Stripe
	Backlight	LED	
	PPI	101 ppi	
	Viewing Angle	±40° Horizontal, ±10°/-30°° Vertical (minimum) 40/40/30/10 (Left/Right/Down/Up)	

STORAGE AND DRIVES

Internal Storage

Technical Specifications

500 GB 5400 rpm SATA Hard Drive	**Drive Weight**	0.22 lb (101 g)	
	Capacity	500 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	150 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	976,773,168	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

320 GB 5400 rpm SATA Hard Drive	**Drive Weight**	0.22 lb (101 g)	
	Capacity	320 GB	
	Height	0.37 in (9.5 mm)	
	Width	2.75 in (70 mm)	
	Interface	ATA-8, SATA 2.6, 3.0 Gb/s, NCQ	
	Transfer Rate	**Synchronous** (maximum)	150 MB/s (Drive Capability)
	Seek Time (typical reads, including settling)	**Single Track**	3 ms
		Average	13 ms
		Maximum	24 ms
	Rotational Speed	5400 rpm	
	Logical Blocks	625,142,448	
	Operating Temperature	32° to 140° F (0° to 60° C) [case temp]	
	Features	ATA Security	

Optical Drives

Technical Specifications

DVD+/-RW SuperMulti DL Drive	**Access Times**	Random	<140ms CD (typical) < 160 ms DVD (typical)
	Max Data Transfer Rate	24X CD-ROM 8X DVD 24X CD-R 24X CD-RW 8X DVD+R 8X DVD+RW 8X DVD-R 6X DVD-RW 5X DVD-RAM	
	Transfer Mode	UDMA Mode 5	
	Interface	Gen 1 SATA	
	Supported Media (read)	CD-DA, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW, DVD-ROM (DVD-5, DVD-9, DVD-10, DVD-18), DVD-R, DVD-RW, DVD+R, DVD+RW, DVD-RAM	
	Supported Media (write)	CD-R, CD-RW, DVD+R, DVD+RW, DVD-R, DVD-RW, DVD-RAM, DVD+R DL, DVD-R DL	
	Max Media Capacity (read)	8.5 GB	
	Max Media Capacity (write)	8.5 GB	
	Transport	Tray Loading	

NETWORKING/COMMUNICATIONS

Networking		
Integrated Realtek RTL8161FH-CG 10/100/1000 NIC	**Ethernet Features**	10 Mbit/s operation (10BASE-T; IEEE 802.3i; IEEE 802.3 clauses 13-14) 100 Mbit/s operation (100BASE-TX; IEEE 802.3u; IEEE 802.3 clauses 21-30) 1000 Mbit/s operation (100BASE-T; IEEE 802.3ab; IEEE 802.3 clauses 21-30) (Support in RTL8161FH-CG only) Auto-Negotiation (Automatic Speed Selection) Full Duplex Operation at all Speeds, Half Duplex operation at 10 and 100 Mbit/s IEEE 802.1p QoS (Quality of Service) Support IEEE 802.1q VLAN support IEEE 802.3x Flow Control (IEEE 802.3 clauses 31-32; configurable
	Power Management	ACPI compliant - multiple power modes Situation-sensitive features reduce power consumption Advanced link down power saving for reducing link down power consumption
	Performance Features	TCP/IP/UDP Checksum Offload (configurable) Large send offload and Giant send offload Receiving Side Scaling

	Manageability	Wake-on-LAN from standby and hibernation (Magic Packet and Microsoft Wake-Up Frame); Wake-on-LAN from off (Magic Packet only) PXE 2.1 Remote Boot Statistics Gathering (SNMP MIB II, Ethernet-like MIB, Ethernet MIB (802.3x, clause 30)) Comprehensive diagnostic and configuration software suite Virtual Cable Doctor for Ethernet cable status
	Interface	PCI Express 1.1 x1 to fully support ASPM L0s/L1 and CLKREQ
	NIC Device Driver Name	Realtek PCIe FE Ethernet Family Controller

Communications

802.11b/g/n WiFi Adapter	**Wireless LAN Standards**	IEEE 802.11b IEEE 802.11g IEEE 802.11n
	Interoperability	Wi-Fi certified Cisco Compatible Extensions Program compliant with Microsoft Win7, (details at: http://www.hp.com/go/notebooks/WLAN)
	Frequency Band	2.402 - 2.482 GHz
	Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: card will support rates for NSS=1 for RX and TX for 20 MHz channels. Short and long guard intervals shall be supported
	Frequency Support	20 MHz: 2.4 GHz bands
	Modulation	Direct Sequence Spread Spectrum DBPSK, DQPSK, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM
	Security[1]	Supports 64- and 128-bit WEP, WPA, WPA2, hardware-accelerated AES, 802.1x authentication types EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, LEAP, EAP-FAST. Support for Cisco Security Features (proven compatibility with Cisco Aironet infrastructure products through the Cisco Compatible Extensions Program Version 5) with Microsoft Windows7only.
	Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.
	Media Access Protocol	CSMA/CA (Collision Avoidance) with ACK
	Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)
	Roaming	IEEE 802.11 compliant roaming between access points
	Output Power	13.5 dBm, minimum
	Power Consumption	Idle associated: 250 mW avg (CLKREQ enabled) Idle unassociated: 100 mW avg Transmit/Receive channel: 2.0 /1.6 W
	Power Management	ACPI compliant power management 802.11 compliant power saving mode
	Receiver Sensitivity[3]	72.2 Mbps: -70 dBm; 54 Mbps: -74 dBm; 11 Mbps: -88 dBm ; 1 Mbps: -95 dBm

Technical Specifications

Antenna type	High efficiency dual antenna with spatial diversity, usually mounted in the display enclosure	
Form Factor	PCI-Express Half-MiniCard	
Weight	4 g	
Dimensions	3.3 x 26.65 x 29.85 mm	
Operating Voltage	3.3v +/- 9%	
Temperature	Operating Non-operating	-10° to 70° C -40° to 80° C
Humidity	Operating Non-operating	10% to 90% (non-condensing) 5% to 95% (non-condensing)
Altitude	Operating Non-operating	0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
LED Activity	Amber LED on-Radio OFF; White LED on-Radio ON	

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

NOTE: WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista and Win7.

802.11b/g/n Bluetooth 4.0 Combo Card	**Wireless LAN Standards**	IEEE 802.11b IEEE 802.11g IEEE 802.11n
	Interoperability	Wi-Fi certified Cisco Compatible Extensions Program compliant with Microsoft Windows7 (details at: http://www.hp.com/go/notebooks/WLAN)
	Frequency Band	2.402 – 2.482 GHz
	Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: card will support rates for NSS=1 for RX and TX for 20 MHz channels. Short and long guard intervals shall be supported
	Modulation	Direct Sequence Spread Spectrum DBPSK, DQPSK, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM
	Security[1]	Supports 64- and 128-bit WEP, WPA, WPA2, hardware-accelerated AES, 802.1x authentication types EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, LEAP, EAP-FAST. WAPI Support for Cisco Security Features (proven compatibility with Cisco Aironet infrastructure products through the Cisco Compatible Extensions Program Version 5) with Microsoft Windows Vista and XP only.
	Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.
	Media Access Protocol	CSMA/CA (Collision Avoidance) with ACK

Technical Specifications

Network Architecture	Ad-hoc (Peer to Peer)	
Models	Infrastructure (Access Point Required)	
Roaming	IEEE 802.11 compliant roaming between access points	
Output Power (for CCK)[2]	13.5dBm , minimum	
Power Consumption	Idle associated: 250 mW Idle unassociated: 150 mW Transmit: 2.0 W (max) Receive: 2.0 W (max)	
Power Management	ACPI compliant power management 802.11 compliant power saving mode	
Receiver Sensitivity[3]	72.2 Mbps: -70 dBm; 54 Mbps: -74 dBm; 11 Mbps: -88 dBm ; 1 Mbps: -95 dBm	
Antenna type	High efficiency dual antenna with spatial diversity, mounted in the display enclosure	
Form Factor	PCI-Express Half-MiniCard	
Weight	6 g	
Dimensions	3.3 x 26.65 x 29.85 mm	
Operating Voltage	3.3v +/- 10%	
Temperature	Operating Non-operating	14° to 149° F (-10° to 65° C) -40° to 176° F (-40° to 80° C)
Humidity	Operating Non-operating	10% to 90% (non-condensing) 5% to 95% (non-condensing)
Altitude	Operating Non-operating	0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
LED Activity	LED Off – Radio OFF; Solid LED On – RadioON	

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

NOTE: WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista and Win7.

Bluetooth Specification	V4.0 High Speed, V2.1+EDR, backwards compatible with V1.1, 1.2 and 2.0	
Number of Available Channels	79 (1 MHz) available channels	
Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric	
Transmit Power	-6 dBm to 4 dBm (Bluetooth Class II)	

Technical Specifications

	Receiver Sensitivity	Better than -80 dBM at 0.1 % raw bit error rate
	Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Sleep <17 mW
	Antenna	Internally integrated within module
	Range	Up to 33 ft (10 m)
	Electrical Interface	USB 2.0 compliant Microsoft Windows Plug and Play compliant
	Bluetooth Software Supported	Broadcom Bluetooth for Windows Microsoft Windows Bluetooth Software
	Link Topology	Point to Point, Multipoint Pico Nets up to 7 slaves
	Security	Full support of Bluetooth Security Provisions
	Power Management	Microsoft Windows ACPI, and USB Bus Support Self configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
	Certifications	All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249 ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
	Bluetooth Profiles Supported	Generic Access Profile (GAP) Service Discovery Application Profile (SDAP) Serial Port Profile (SPP) Dial_Up Networking Profile (DUN) Generic Object Exchange Profile (GOEP) Object Push Profile (OPP) File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) Personal Area Networking Profile (PAN) Human Interface Device Profile (HID) Generic Audio/Video Distribution Profile (GAVDP) Advanced Audio/Video Distribution Profile (A2DP) FAX Profile (FAX) Basic Imaging Profile (BIP) Headset Profile (HSP) Hands Free Profile (HFP) Basic Printing Profile (BPP) VDP (Video Distribution Profile) AVRCP (Audio Video Remote Control Profile)
802.11b/g/n Bluetooth 4.0 Combo Card	**Wireless LAN Standards**	IEEE 802.11b IEEE 802.11g IEEE 802.11n
	Interoperability	Wi-Fi certified Cisco Compatible Extensions Program compliant with Microsoft Windows7 (details at: http://www.hp.com/go/notebooks/WLAN)

Technical Specifications

Frequency Band	2.402 – 2.482 GHz	
Data Rates	802.11b: 1, 2, 5.5, 11 Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n: card will support rates for NSS=1 for RX and TX for 20 MHz channels. Short and long guard intervals shall be supported	
Modulation	Direct Sequence Spread Spectrum DBPSK, DQPSK, CCK, OFDM, BPSK, QPSK, 16-QAM, 64-QAM	
Security[1]	Supports 64- and 128-bit WEP, WPA, WPA2, hardware-accelerated AES, 802.1x authentication types EAP-TLS, EAP-TTLS, PEAP-GTC, PEAP-MSCHAPv2, LEAP, EAP-FAST. WAPI Support for Cisco Security Features (proven compatibility with Cisco Aironet infrastructure products through the Cisco Compatible Extensions Program Version 5) with Microsoft Windows Vista and XP only.	
Sub-channels	Multinational support with frequency bands and channels compliant to local regulations.	
Media Access Protocol	CSMA/CA (Collision Avoidance) with ACK	
Network Architecture Models	Ad-hoc (Peer to Peer) Infrastructure (Access Point Required)	
Roaming	IEEE 802.11 compliant roaming between access points	
Output Power (for CCK)[2]	13.5dBm , minimum	
Power Consumption	Idle associated: 250 mW Idle unassociated: 150 mW Transmit: 2.0 W (max) Receive: 2.0 W (max)	
Power Management	ACPI compliant power management 802.11 compliant power saving mode	
Receiver Sensitivity[3]	72.2 Mbps: -70 dBm; 54 Mbps: -74 dBm; 11 Mbps: -88 dBm ; 1 Mbps: -95 dBm	
Antenna type	High efficiency dual antenna with spatial diversity, mounted in the display enclosure	
Form Factor	PCI-Express Half-MiniCard	
Weight	6 g	
Dimensions	3.3 x 26.65 x 29.85 mm	
Operating Voltage	3.3v +/- 10%	
Temperature	Operating Non-operating	14° to 149° F (-10° to 65° C) -40° to 176° F (-40° to 80° C)
Humidity	Operating Non-operating	10% to 90% (non-condensing) 5% to 95% (non-condensing)
Altitude	Operating Non-operating	0 to 10,000 ft (3,048 m) 0 to 50,000 ft (15,240 m)
LED Activity	LED Off – Radio OFF; Solid LED On – RadioON	

1. Check latest software/driver release for updates on supported security features.
2. Maximum output power may vary by country according to local regulations.
3. Receiver sensitivity is measured at a packet error rate of 8% for 802.11b (CCK modulation) and a packet error rate of 10% for 802.11a/g (OFDM modulation).

NOTE: WLAN supplier's client utility is required for Cisco Compatible Extensions support with Microsoft Windows XP. WLAN may also be compatible with certain third-party software supplicants. WLAN supplier IHV extensions required for Cisco Compatible Extensions support for Microsoft Windows Vista and Win7.

Bluetooth Specification	V4.0 High Speed, V2.1+EDR, backwards compatible with V1.1, 1.2 and 2.0	
	Number of Available Channels	79 (1 MHz) available channels
	Data Rates and Throughput	3 Mbps data rate; throughput up to 2.17 Mbps Synchronous Connection Oriented links up to 3, 64 kbps, voice channels Asynchronous Connection Less links 2178.1 kbps/177.1 kbps asymmetric or 1306.9 kbps symmetric
	Transmit Power	-6 dBm to 4 dBm (Bluetooth Class II)
	Receiver Sensitivity	Better than -80 dBM at 0.1 % raw bit error rate
	Power Consumption	Peak (Tx) 330 mW Peak (Rx) 230 mW Sleep <17 mW
	Antenna	Internally integrated within module
	Range	Up to 33 ft (10 m)
	Electrical Interface	USB 2.0 compliant Microsoft Windows Plug and Play compliant
	Bluetooth Software Supported	Broadcom Bluetooth for Windows Microsoft Windows Bluetooth Software
	Link Topology	Point to Point, Multipoint Pico Nets up to 7 slaves
	Security	Full support of Bluetooth Security Provisions
	Power Management	Microsoft Windows ACPI, and USB Bus Support Self configurable to optimize power conservation in all operating modes, including Standby, Hold, Park, and Sniff
	Certifications	All necessary regulatory approvals for supported countries, including: FCC (47 CFR) Part 15C, Section 15.247 & 15.249 ETS 300 328, ETS 300 826 Low Voltage Directive IEC950 UL, CSA, and CE Mark
	Bluetooth Profiles Supported	Generic Access Profile (GAP) Service Discovery Application Profile (SDAP) Serial Port Profile (SPP) Dial_Up Networking Profile (DUN) Generic Object Exchange Profile (GOEP) Object Push Profile (OPP) File Transfer Profile (FTP) Synchronization Profile (SYNC) Hard Copy Cable Replacement (HCRP) Personal Area Networking Profile (PAN) Human Interface Device Profile (HID) Generic Audio/Video Distribution Profile (GAVDP)

	Advanced Audio/Video Distribution Profile (A2DP) FAX Profile (FAX) Basic Imaging Profile (BIP) Headset Profile (HSP) Hands Free Profile (HFP) Basic Printing Profile (BPP) VDP (Video Distribution Profile) AVRCP (Audio Video Remote Control Profile)

AUDIO/MULTIMEDIA

Audio

Hardware	**Implementation**	Realtek ALC3201-GR High Definition audio
	Volume Controls	Up, down, and mute function keys
	Full Duplex	Yes
	Microphone In	Stereo
	Headphone/Line Out	Stereo
	Integrated Microphone	Yes
Audio Output Quality	**Frequency Response**	10 Hz ~ 22 KHz
	Signal to Noise Ratio	Typical 95 dB FSA (DAC)
	Total Harmonic Distortion	Typical -88 dB FS (DAC)
	Noise Floor	-110 dB
	Play/Record Sampling Rate(s)	Up to 192 KHz
	DAC	24 bits
	ADC	24 bits
Internal Stereo Speaker	**Power Rating**	1.5 W
	Impedance	4 ohms

Multimedia

Integrated VGA Webcam	Supports videoconferencing and still image capture Improved quality for video streaming and still image capture (640 x 480 resolution) Up to 24 frames/sec Fixed focus lens

Technical Specifications

Integrated HD Webcam	Supports videoconferencing and still image capture Improved quality for video streaming and still image capture (1280x720 resolution) Up to 30 frames/sec Fixed focus lens

POWER

HP 65W AC Adapter	**Dimensions**	4.21 x 1.85 x 1.18 in (10.7 x 4.7 x 3.0 cm)	
	Weight	0.62 lb (280 g)	
	Input	100 to 240 VAC	
		Input Efficiency	87% min at 115 VAC
		Input frequency range	47 to 63 Hz
		Input AC current	1.7 A at 90 VAC
	Output	**Output power**	65W
		DC output	18.5/19.5V
		Hold-up time	5 msec at 115 VAC input
		Output current limit	<11A, Over voltage protection- 29V max automatic shutdown
	Connector	3 pin/grounded, mates with interchangeable cords	
	Environmental Design	**Operating temperature**	41° to 95° F (5° to 35° C)
		Non-operating (storage) temperature	-4° to 185° F (-20° to 85° C)
		Altitude	0 to 5,000 ft (0 to 1,524 m)
		Humidity	20% to 95%
		Storage Humidity	10% to 95%
	EMI and Safety Certifications	CE Mark - full compliance with LVD and EMC directives; Worldwide safety standards - IEC60950, EN60950, UL60950, Class1, SELV; Agency approvals - C-UL-US, NORDICS, DENAN, EN55022 Class B, FCC Class B, CISPR22 Class B, CCC, NOM-1 NYCE; MTBF - over 200,000 hours at 25°C ambient condition.	

Technical Specifications

6-Cell (47 WHr) Lithium-Ion battery	**Dimensions** (h x w x l)	0.85 x 2.06 x 8.07 in (2.17 x 5.23 x 20.5 cm)	
	Weight	0.7 lb (0.327 kg)	
	Cells/Type	6-cell Lithium-Ion	
	Energy Temperature	**Watt-hour capacity**	47 WHr
		Operating (Charging)	32° to 113° F (0° to 45° C)
		Operating (Discharging)	14° to 140° F (-10° to 60° C)
		Non-operating	-4° to 140° F (-20° to 60° C)
	Battery Re-Charge Time	**System in OFF or Standby Mode**	2.5 hours
		System ON	3 to 5 hours (depending on system power consumption)
		HP Fast Charge Technology	Charges the battery up to 90% within 90 minutes when system is OFF

ENVIRONMENTAL

Eco-Label Certifications This product has received or is in the process of being certified to the following approvals and may be labeled with one or more of these marks:

US Energy Star
IT ECO declaration
EPEAT – Silver where HP registers commercial notebook products. See http://www.epeat.net for registration status in your country.
US Federal Energy Management Program (FEMP)

System Configuration The configuration used for the Energy Consumption and Declared Noise Emissions data for these models are based on a "Typically Configured Notebook"

Energy Consumption	115 VAC	230 VAC	100 VAC
Normal Operation	7.23 W	7.37 W	7.22 W
Sleep (Energy Star low power mode)	0.848 W	0.891 W	0.850 W
Off	0.399 W	0.437 W	0.399 W

Heat Dissipation*	115 VAC	230 VAC	100 VAC
Normal Operation	24.7 BTU/hr	25.2 BTU/hr	24.6 BTU/hr
Sleep	2.9 BTU/hr	3 BTU/hr	2.9 BTU/hr
Off	1.4 BTU/hr	1.5 BTU/hr	1.4 BTU/hr

* Heat dissipation is calculated based on the measured watts, assuming the service level is attained for one hour.

Declared Noise Emissions (in accordance with ISO 7779 and ISO 9296)

Technical Specifications

System Fan Off	Sound Power (LWAd, bels)	Sound Pressure (LpAm, decibels)
Idle	2.8	21
Fixed Disk (random writes)	3.2	26

System fan is usually off except when charging the battery

Batteries

This battery(s) in this product comply with EU Directive 2006/66/EC

Batteries used in the product do not contain:

- Mercury greater the 5ppm by weight
- Cadmium greater than 10ppm by weight

The battery type and chemistry used in the product is:
CR2032 (coin cell), Li-ion
6-cell high capacity Lithium-Ion battery (optional 8 cell available)

Additional information

This product is in compliance with the Restrictions of Hazardous Substances (RoHS) directive – 2002/95/EC.

This HP product is designed to comply with the Waste Electrical and Electronic Equipment (WEEE) Directive – 2002/96/EC.

This product is in compliance with California Proposition 65 (State of California; Safe Drinking Water and Toxic Enforcement Act of 1986).

This product is in compliance with the IEEE 1680 (EPEAT) standard at the Silver level, see: www.epeat.net

Plastics parts weighing over 25 grams used in the product are marked per ISO 11469 and ISO1043.

This product contains 0% post consumer recycled plastic (by wt.)

This product is greater than 94.8% recycle-able when properly disposed of at end of life.

Packaging Materials

- External:
  - PAPER/Corrugated – 361 g
- Internal:
  - PLASTIC/EPE-Expanded Polyethylene 28 g
  - PLASTIC/Polyethylene low density 36 g
  - PLASTIC/Polypropylene 15 g
  - OTHER/OTHER 20 g
- The PAPER/Corrugated solid packaging material is made from 74% recycled content.
- The PLASTIC/EPE-Expanded Polyethylene is made from 0% recycled content.
- The PLASTIC/Polyethylene low density is made from 0% recycled content
- The PLASTIC/Polypropylene is made from 0% recycled content
- The OTHER/OTHER is made from 0% recycled content

HP follows these guidelines to decrease the environmental impact of product packaging:

- Eliminate the use of heavy metals such as lead, chromium, mercury and cadmium in packaging

materials.
- Eliminate the use of ozone-depleting substances (ODS) in packaging materials.
- Design packaging materials for ease of disassembly.
- Maximize the use of post-consumer recycled content materials in packaging materials.
- Use readily recyclable packaging materials such as paper and corrugated materials.
- Reduce size and weight of packages to improve transportation fuel efficiency.
- Plastic packaging materials are marked according to ISO 11469 and DIN 6120 standards.

MATERIAL USAGE

This product does not contain any of the following substances in excess of regulatory limits (for reference of these limits please refer to the HP General Specification of the Environment (http://www.hp.com/hpinfo/globalcitizenship/environment/supplychain/gen_specifications.html):

- Asbestos
- Certain Azo Colorants
- Certain Brominated Flame Retardants – may not be used as flame retardants in plastics
- Cadmium
- Chlorinated Hydrocarbons
- Chlorinated Paraffins
- Formaldehyde
- Halogenated Diphenyl Methanes
- Lead carbonates and sulfates
- Lead and Lead compounds
- Mercuric Oxide Batteries
- Ozone Depleting Substances
- Polybrominated Biphenyls (PBBs)
- Polybrominated Biphenyl Ethers (PBBEs)
- Polybrominated Biphenyl Oxides (PBBOs)
- Polychlorinated Biphenyl (PCB)
- Polychlorinated Terphenyls (PCT)
- Polyvinyl Chloride (PVC) – except for wires and cables, and certain retail packaging has been voluntarily removed from most applications.
- Radioactive Substances
- Tributyl Tin (TBT), Triphenyl Tin (TPT), Tributyl Tin Oxide (TBTO)
- Nickel finishes that release greater than 0.5 µgrams/cm^2/week, measured according to EN 1811:1998, are not used on any product surface designed to be frequently handled or touched by users.

END-OF-LIFE MANAGEMENT AND RECYCLING

Hewlett-Packard offers end-of-life HP product return and recycling programs in many geographic areas. To recycle your product, please go to: http://www.hp.com/go/reuse-recycle or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: http://www.hp.com/go/recyclers. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

HEWLETT-PACKARD CORPORATE ENVIRONMENTAL INFORMATION

For more information about HP's commitment to the environment:

Technical Specifications

Global Citizenship Report
http://www.hp.com/hpinfo/globalcitizenship/gcreport/index.html
Environment website
http://www.hp.com/environment
Eco-label certifications
http://www.hp.com/hpinfo/globalcitizenship/environment/productdesign/ecolabels.html
ISO 14001 certificates:
http://www.hp.com/hpinfo/globalcitizenship/environment/operations/envmanagement.html

Options and Accessories (sold separately and availability may vary by country)

NOTE: Options/capabilities listed in the QuickSpecs represent those capabilities available through Base Units or Build to Order configurations. The various product features and capabilities will vary in terms of configurable vs. aftermarket options (AMOs). There may be options and capabilities available through CTO that are not available as AMOs.

Type	Description	Part #
Memory	HP 2 GB (DDR3 1333 MHz) SODIMM	AT912AA#xxx
	HP 4 GB (DDR3 1333 MHz) SODIMM	AT913AA#xxx
	HP 2 GB PC3-12800 (DDR3 1600 MHz) SODIMM	H2P63AA#xxx
	HP 4 GB PC3-12800 (DDR3 1600 MHz) SODIMM	H2P64AA#xxx
	NOTE: Full availability of 4 GB or more of memory requires Windows Vista Business 64-bit or Linux. With Windows 32-bit operating systems, the amount of usable memory is dependent upon your configuration, so that above 3 GB all memory may not be available due to system resource requirements.	
Expansion Solutions	HP Dual Hinge Notebook Stand	AW661AA
	HP Display and Notebook Stand	AW662AA
	HP 2005pr USB 2.0 Port Replicator	H1L07AA
Carrying Cases	HP Essential Top Load Case	H2W17AA
	HP Essential Backpack	H1D24AA
	HP Essential Messenger Case	H1D25AA
Input/Output	HP 2.4 GHz Wireless Optical Mobile Mouse	LX732AA
	HP Wireless Mobile Mouse	H2L63AA
	HP USB Essential Keyboard/Mouse	H2S75AA
Adapters	HP 90W Slim Adapter	BT796AA
	HP 90W Smart AC/Auto/Air Combo Adapter	ED493AA
Storage - External Storage	HP Mobile USB DVDRW	A2U57AA
Battery	HP MU06 Battery	H0F74AA
	HP MU06XL Long Life Notebook Battery	WD548AA

Options and Accessories (sold separately and availability may vary by country)

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